



Breydon Bridge, Great Yarmouth, Norfolk

For The Departments of The Environment and Transport

Breydon Bridge carries the A47 Great Yarmouth Western Bypass over the River Yare at the mouth of Breydon Water, 300m upstream from the confluence of the River Bure with the Yare. The 10m wide single carriageway is carried on eight approach spans each approximately 26m long and one opening navigation span of the overhead bascule type, 31m long. The overall length of the bridge is 247m. The bridge follows exactly the line of a previous railway viaduct incorporating a swing bridge which was demolished in 1962, although the piers and abutments of the new bridge are positioned to miss the old piled foundations of the railway structure.

The eight approach spans are of conventional composite construction. Each simply supported span comprises longitudinal steel beams of I or channel section acting compositely with a reinforced concrete deck. Fabricated channel sections were adopted for the edge beams to present a clean elevation free of flange outstands. Grade 50 steel is used throughout for structural members.

Although pleasure craft form the major part of river traffic, commercial shipping still uses the Yare to serve Cantley and Norwich, and thus a navigation span had to be provided. A high level structure was not appropriate at this site and it was therefore necessary to provide an opening span.

Three possible types of structures were considered: a swing bridge, a bascule bridge with an underslung counterweight and a bascule bridge with an overhead counterweight. A swing bridge requires less installed power than a bascule bridge, but at this site would have significant disadvantages in that it would form a greater length of obstruction to the deep water channel, and when in the "river open" position would be inaccessible by road for maintenance.

Although requiring greater installed power to drive the lifting leaf against the wind, bascules are structurally simpler, provide less obstruction to river traffic and at this site would be accessible by road when raised. The overhead counterweight type was chosen for Breydon because it avoided the need for extensive cofferdam construction in the fast flowing deep water channel. However, at the time this decision was made, it was realised that the towers and counterweight frame would present obvious visible features in the essentially low lying landscape, which would require careful attention to render them attractive in their environment. The design for the crossing incorporating the overhead counterweight bridge was submitted to and accepted by the Royal Fine Art Commission. For moving structures of this type, steel is the natural choice of construction material. To reduce dead weight, grade 50 steel was used for all structural components of the lifting leaf, counterweight and towers.

The leaf is of orthotropic plate construction, comprising two I section main girders supporting cross girders and a longitudinally trough-stiffened deck plate surfaced with epoxy bauxite.

The towers and counterweight frame are of box construction, stiffened internally both longitudinally and transversely. The use of box construction enabled a clean sharp outline to be achieved. All cabling is carried internally and navigation lights, floodlights, limit switches etc recessed in the structure. The steelwork is protected by metal spray and a multicoat paint system with a silicone alkyd finish.

The bridge leaf is driven by four hydraulic cylinders arranged in two pairs, each supplied with oil from an electrically powered multiple pump system, with a diesel standby generator provided for bridge operation in the event of an interruption of the normal power supply.

The weight of steelwork in the approach spans totals 650 tonnes, and in the bascule span, towers and counterweight frame, 525 tonnes.

Detailed design commenced in July 1981, and construction on site in June 1983. The bascule bridge superstructure was fabricated in Darlington in sizes which could be transported by road to Great Yarmouth. A site downstream was used to assemble and paint the counterweight arms and the bascule deck. Assembly at Great Yarmouth commenced in July 1984 and was completed by the latter part of January 1985. The bridge was completed in May 1985, in advance of the approaches and was opened to traffic on the 24th March 1986.

The total cost of the bridge was approximately £9.0M. The steelwork in the approach spans cost approximately £830,000 and the cost of the steelwork in the bascule span, approximately £1,125,000.

Structural Engineers: Husband and Co.

Steelwork Contractor: The Cleveland Bridge and Engineering Co. Ltd.

Judges' comments:

The versatility of design, detail, and speed of erection makes steel a natural choice for this bridge, and has enabled a simple elegant solution to be evolved. Its clean lines admirably satisfy the requirements of operation, inspection and maintenance.